

SECTION 15260  
PIPE INSULATION

PART 1 GENERAL

1.1 SUMMARY (Not Applicable)

1.1.1 Extend of mechanical insulation required by this section is indicated on drawings and schedules, and by requirements of this section.

1.1.2 Types of mechanical insulation specified in this section include the following:

- a. Fiberglass.
- b. Cellular glass.
- c. Calcium silicate.
- d. Flexible unicellular.

1.2 REFERENCES : ASTM C533, ASTM C547, ASTM C552.

1.3 SUBMITTALS

See Section 15003, SD-17, 33, 70 and 76.

1.4 GENERAL REQUIREMENTS

Section 15003 "General Mechanical Provisions", Section 15050,"Pipe, Valves and Specialties", Section 15061,"Steel Pipes (150, 300 and 2000 psi)", and Section 15066,"Stainless Steel Pipe (300 to 2000 psi)".

1.5 SURFACES TO BE INSULATED

Insulation thickness and pipe sizes are in inches. Pipe size is inclusive dimensionally, and includes pipe nominal pipe size (NPS) and tubing outside diameter.

1.5.1 Dual-Temperature (Hot- and Chilled-) Water Piping

Insulation shall be mineral fiber with vapor barrier jacket (Type T-1). The

thickness shall be not less than that given in the following list.  
Aboveground pipes, valve bodies, fittings, unions, and flanges shall be insulated.

PIPE SIZE (INCHES)	INSULATION THICKNESS (INCHES)
Up to 1-1/4	1
1-1/4 to 3	1-1/2
3 and larger	2

#### 1.5.2 Hot-Water, Steam, and Condensate-Return Piping

Insulation shall be mineral fiber with glass cloth jacket (Type T-2). The thickness shall be not less than that given in the following list.  
Aboveground pipes, valve bodies, fittings, unions, flanges, and miscellaneous surfaces shall be insulated.

PIPE SIZES (INCHES)	INSULATION THICKNESS (INCHES)
Up to 4	1
4 to 10	1-1/2
10 to 12	2

#### 1.5.3 Cold-Water and Condensate-Drain Piping

Aboveground pipes, valve bodies, fittings, unions, flanges, and miscellaneous surfaces shall be insulated.

Insulation shall be 3/8-inch mineral fiber with glass cloth jacket (Type T-2) or cold-water piping insulation shall be flexible unicellular-elastomeric thermal insulation (Type T-3) as indicated. T-3 pipe insulation thickness shall be 3/8 or 1/2 inch per calculation. The expanded, closed-cell pipe insulation shall be used only aboveground, not for underground piping.

#### 1.5.4 Refrigerant Suction Piping

Insulation shall be cellular-elastomer (Type T-3). The thickness shall be nominal 3/4 inch, unless otherwise indicated. Surfaces, including valve, fittings, unions, and flanges, shall be insulated.

#### 1.5.5 Cooling-Tower Circulating Water Piping

Insulation shall be cellular-elastomer (Type T-3). The thickness shall be not less than that given in the following list. Aboveground pipes, valve bodies, fittings, unions, flanges, and miscellaneous surfaces shall be insulated.

PIPE SIZE (INCHES)	THICKNESS EXPOSED TO WEATHER (INCH)
Up to 2	1/2
2 to 6	3/4
6 and larger	1

Thickness inside buildings shall be 3/8 inch for all pipe sizes unless otherwise indicated.

Insulation shall be mineral fiber with aluminum jacket (Type T-6). The thickness shall be not less than that indicated. Aboveground pipes, valve bodies, fittings, unions, flanges, and miscellaneous surfaces shall be insulated.

#### 1.5.6 Steam and Condensate Piping, 350 psig

Insulation shall be calcium silicate with glass cloth jacket (Type T-5). The thickness shall be not less than indicated in following list which is based on:

80-degree F still air ambient

Insulation "K" factor of 0.37 at 200 degrees F mean temperature

Maximum surface temperatures of 112 degrees F for pipe sizes through 1-1/2-inch ips; 110 degrees F for pipe sizes through 4-inch ips; 107 degrees F for pipe sizes through 8-inch ips; 104 degrees F

for pipe sizes through 12-inch ips

Piping shall be insulated, including fittings, valve bodies, unions, and flanges, except equipment such as steam traps.

#### 1.5.7 Hot Water Heating Convertor

Insulation shall be calcium silicate with glass cloth jacket (Type T-7). Thickness shall be 1-1/2 inches.

#### 1.5.8 Chilled-Water and Dual-Temperature Pumps

Insulation shall be cellular elastomer (Type T-9). The thickness shall be 1 inch. Surfaces subject to condensation shall be covered, and a vapor-barrier coating shall be supplied.

#### 1.5.9 Low-Pressure Steam and Condensate, Weather-Exposed

Insulation shall be calcium silicate with weatherproof jacket (Type T-17). Thickness, in inches, shall be not less than that indicated in the following list. All systems shall be insulated.

Size (conduit)	4	10 and larger
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Thickness (insulation)	1-1/2	2
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#### 1.5.10 Steam and Condensate, Weather-Exposed, 125 psig

Insulation shall be calcium silicate with weatherproof jacket (Type T-17). Thickness, in inches, shall be not less than that indicated in the following list. All system surfaces shall be insulated.

Size (conduit)	1-1/2	4	10 and larger
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Thickness (insulation)	1-1/2	2	3
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#### 1.5.11 Steam and Condensate, Weather-Exposed, 350 psig

Insulation shall be calcium silicate with weatherproof jacket, (Type T-17). Thickness, in inches, shall be not less than that indicated in the following list. All system surfaces shall be insulated.

Size (conduit)	1-1/4	5	12
Thickness (insulation)	1-1/2	2	3

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 General

Thermal-insulation system materials shall be noncombustible, as defined by NFPA 220, unless otherwise specified. Adhesives, coatings, sealants, facings, jackets, and thermal-insulation materials, except cellular elastomers, shall have a flame-spread classification (FSC) of 25, and a smoke-developed classification (SDC) of 50. These maximum values shall be determined in accordance with procedures defined in ASTM E84 or NFPA 255. Adhesives, coatings, and sealants shall be nonflammable in their wet state.

Adhesives, coatings, and sealants shall have published or certified temperature ratings suitable for the entire range of working temperatures normal for the surfaces to which they are to be applied.

#### 2.1.2 Adhesives

Adhesives for attaching laps of vapor-barrier materials and presized glass cloth and for attaching insulation to itself, to metal, and to various other substrates, shall be solvent-base, synthetic-rubber type and shall conform to the requirements of MIL-A-3316, Class 2 (for attaching fibrous-glass insulation to metal surfaces). Solvent shall be nonflammable.

Adhesives for adhering, sizing, and finishing asbestos lagging cloth, canvas, and open-weave glass cloth shall be a pigmented polyvinyl acetate emulsion and shall conform to the requirements of MIL-A-3316, Class 1.

Adhesive for cellular elastomer insulation shall be a solvent cutback chloroprene elastomer conforming to MIL-A-24179, Type II, Class 1, and

shall be of a type approved by the manufacturer of the cellular elastomer for the intended use.

### 2.1.3 Coatings

Coatings for outdoor vapor-barrier finishing of insulation surfaces such as fittings and elbows shall be a nonasphaltic, hydrocarbon polymer, solvent-base mastic containing a blend of nonflammable solvents. Coatings shall conform to the requirements of MIL-C-19565.

Coatings for indoor vapor-barrier finishing of insulation surfaces shall be a pigmented resin and solvent compound and shall conform to FS HH-B-100, Type II.

Coatings for outdoor and indoor nonvapor-barrier finishing of insulation surfaces shall be pigmented polymer-emulsion type recommended by the insulation material manufacturer for the surface to be coated and shall be applied to specified dry-film thickness.

Finish coating for cellular-elastomer insulation shall be a polyvinylchloride lacquer approved by the manufacturer of the cellular elastomer.

Coating colors shall conform to standard colors and shall be selected by the Contracting Officer.

### 2.1.4 Insulating Cement

General purpose insulating cement shall be diatomaceous silica, mineral fiber, or a composition of both. Mineral fiber shall conform to ASTM C195. The composite shall be rated for 1,800 degrees F service and shall have a thermal-conductivity maximum of 0.85 Btu per hour per square foot for each degree F temperature differential at 200 degrees F mean temperature for 1 inch thickness.

Finishing insulating cement shall be mineral-fiber, hydraulic-setting type conforming to ASTM C449.

### 2.1.5 Insulation Materials

Insulation conductances required by the specifications shall be regarded as maximum, as tested at any point, not average. Insulation conductance

found by test to exceed the stipulated maximum shall either be replaced or be augmented by an additional thickness to bring it to the required maximum conductance and a complete finishing system.

Mineral fiber shall conform to FS HH-I-558, shall be suitable for surface temperatures up to 370 degrees F, and shall be of not less than 4-pound density, unless otherwise specified. Thermal conductivity shall be not greater than 0.26 at 150 degrees F mean, unless otherwise specified.

Pipe barrel insulation shall be Form D (sleeving, pipe, and the tube covering), Type III (Molded), Class 12 (For use at temperatures up to and including 450 degrees F).

Pipe fitting insulation shall be Form E (molded pipe fitting covering), Class 16 (for use at temperatures up to and including 450 degrees F), except as otherwise specified.

Flexible blankets shall be Form B (blankets and felts, flexible), Class 6 (resilient for use at temperatures up to and including 350 degrees F), minimum 1 pound density. Thermal conductivity shall be not greater than 0.27 at 75 degrees F mean.

Cellular elastomer shall conform to ASTM C534, except that the water-vapor permeability (Table 1 of ASTM C534 shall not exceed 0.30 perms per square foot per hour per inch mercury pressure difference for 1-inch thickness.

Cellular glass shall conform to ASTM C552, Type II (pipe covering).

Substitutions for this material will not be permitted.

Calcium silicate shall conform to ASTM C533. Thermal conductivity shall be not greater than 0.37 at 200 degrees F mean, except as otherwise specified.

#### 2.1.6 Jacketing

Aluminum sheet shall be 0.016 inch thick with factory-applied vapor barrier on the insulation side. Aluminum shall be made from smooth, polished, Aluminum Association Alloy 3003. Straps shall be AISI 300

series corrosion-resistant steel, 15 mils thick, 1/2 inch wide.

Elbow jackets shall be 0.016-inch-thick, deep-drawn, die-shaped, two-piece components for long-radius, butt-weld elbows manufactured from the same materials as specified for jackets, with factory-attached vapor-seals on underside of the aluminum. Preinsulated, voidless, jacketed components conforming to these specifications shall be used, unless otherwise specified. Preinsulated fittings shall have a 2-inch overlay beyond route for weld bead.

Vapor barrier shall be 30-60-30 laminated-asphalt paper or 60-pound kraft paper with 10-pound polyethylene coating.

Pipe jackets shall have not less than 2-inch longitudinal and circumferential lap.

Sealant for longitudinal and butt joints of aluminum jacketing shall be an aluminum-pigmented, butyl, polymer sealant with high-butyl solids.

Glass cloth shall be plain-weave glass cloth conforming to ASTM D579, Style 141 and shall weigh not less than 7.23 ounces per square yard before sizing. Cloth shall be factory applied wherever possible.

Glass reinforcing cloth shall be a leno weave, 26-end and 12-pick thread conservation, with a warp and fill tensile strength of 50 and 30 pounds per inch of width, respectively, and with a weight of not less than 1.5 ounces per square yard. At the Contractor's option, Style 191 leno-weave glass cloth conforming to ASTM D579 may be provided.

Polyvinylchloride shall be a 0.010-inch-thick, factory-premolded, one-piece fitting or pipe-barrel sheeting vapor-barrier jacketing. Material shall be self-extinguishing, and shall conform to FS L-P-535, Composition A (polyvinylchloride), Type II (high-impact strength, moderate chemical resistance). Permeability rating shall be 0.01 grain per hour per square foot per inch of mercury pressure difference, determined in accordance with the procedures of ASTM E96. Vapor-barrier joint adhesive shall be the manufacturer's standard solvent-weld type.

Vapor barrier shall conform to FS HH-B-100, Type I (low-vapor transmission, high-puncture resistance for use on insulation for piping, ducts, and equipment), and to requirements specified herein.



Jacketing shall be a 3-ply laminate of 35-pound white-bleached kraft, bonded to not less than 0.0007-inch-thick aluminum foil and reinforced with glass fiber.

Water-vapor permeance rating of the composite shall be 0.02 perm or grain per hour per square foot, per inch of mercury pressure differential, determined in accordance with the procedures of ASTM E96.

#### 2.1.7 Tape

Glass lagging shall be a knitted elastic cloth specifically suitable for continuous spiral wrapping of insulated pipe bends and fittings and shall produce a smooth, tight, wrinkle-free surface. Tape shall conform to requirements of MIL-C-0020079 and shall weigh not less than 10 ounces per square yard.

### PART 3 EXECUTION

#### 3.1 INSULATION SYSTEMS

Contours on exposed work shall be smooth and continuous. Cemented laps, flaps, bands, and tapes shall be smoothly and securely pasted down. Adhesives shall be applied on a full-coverage basis, unless otherwise specified.

Insulation shall be applied only to system or component surfaces that have been tested and approved.

Joints shall be tight with insulation lengths tightly butted against each other. Where lengths are cut, cuts shall be smooth and square and without breakage of end surfaces. Where insulation terminates, ends shall be neatly tapered and effectively sealed, or finished as specified. Longitudinal seams of exposed insulation shall be directed away from normal view.

Materials shall be applied in conformance with the recommendations of the manufacturer, except as otherwise specified herein.

Surfaces shall be clean and free of oil and grease before insulation

adhesives or mastics are applied. Solvent cleaning required to bring metal surfaces to such condition shall be provided.

- 3.1.1 Type T-1, Mineral Fiber With Vapor-Barrier Jacket Piping shall be covered with mineral-fiber pipe insulation with factory-and field-attached vapor-barrier jacket. The vapor seal shall be maintained. Jackets, jacket laps, flaps, and bands shall be securely cemented in place with vapor-barrier adhesive. Jacket overlap shall be not less than 1-1/2 inches. Jacketing bands for butt joints shall be 3 inches wide. Exposed-to-view fittings and valve bodies shall be covered with preformed mineral-fiber pipe-fitting insulation of the same thickness as the pipe-barrel insulation. The fitting insulation shall be temporarily secured in place with light cord ties. A 60-mil coating of white indoor vapor-barrier coating shall be applied and, while still wet, wrapped with glass lagging tape with 50 percent overlap, and shall be smoothly blended into the adjacent jacketing. Additional coating shall be applied as needed and rubber-gloved to smooth fillet or contour coating, then allowed to fully cure before the finish coating is applied. On-the-job-fabricated insulation for concealed fittings and special configurations shall be built up from mineral fiber and a special mastic consisting of a mixture of insulating cement and lagging adhesive diluted with 3 parts water. Where standard vapor-barrier jacketing cannot be used, the surfaces shall be made vapor tight by using coating and glass lagging cloth or tape as specified above. In lieu of materials and methods specified above, fittings may be wrapped with a twine-secured, mineral-wool blanket to the required thickness and covered with premolded polyvinylchloride jackets. Seams shall be made vapor tight with a double bead of manufacturer's standard vapor-barrier adhesive applied in accordance with the manufacturer's instructions. All jacket ends shall be held in place with AISI 300 series corrosion-resistant steel straps, 15 mils thick by 1/2 inch wide.

Pipe insulation shall be set into an outdoor vapor-barrier coating for a minimum of 6 inches at maximum 12-foot spacing and the ends of the insulation sealed to the jacketing with the same material to provide an effective vapor-barrier stop.

Staples shall not be used in applying insulation. Vapor-barrier materials shall be continuous over all surfaces, including areas inside pipe sleeves, hangers, and other concealments.

Piping insulation at hangers shall consist of 13-pound density, fibrous-glass inserts or expanded, rigid, closed-cell, polyvinylchloride.

Junctions shall be sealed with vapor-barrier jacket where required, glass-cloth mesh tape, and vapor-barrier coating.

The white-bleached kraft paper side of the jacketing shall be on the side exposed to view.

Exposed-to-view insulation shall be finished with not less than a 6-mil dry-film thickness of nonvapor-barrier coating suitable for painting.

### 3.1.2 Type T-2, Mineral Fiber With Glass Cloth Jacket

Piping shall be covered with a mineral-fiber, pipe insulation with factory-attached, presized, white, glass cloth. Jackets, jacket laps, flaps, and bands shall be securely cemented in place with vapor-barrier adhesive. Jacket overlap shall be not less than 1-1/2 inches. Jacketing bands for butt joints shall be 3 inches wide.

Exposed-to-view fittings shall be covered with preformed mineral-fiber fitting insulation of the same thickness as the pipe insulation and temporarily secured in place with light cord ties. Impregnated glass lagging tape shall be installed with indoor vapor-barrier on 50 percent overlap basis and the tape shall be blended smoothly into the adjacent jacketing. Additional coating shall be applied as needed, and rubber gloved to a smooth contour. Ends of insulation shall be taped to the pipe at valves 2 inches and smaller. On-the-job-fabricated insulation for concealed fittings and special configurations shall be built up from mineral fiber and a mixture of insulating cement and lagging adhesive, diluted with 3 parts water. Surfaces shall be finished with glass cloth or tape lagging.

Valves 2-1/2 inches and larger and all flanges shall be covered with preformed insulation of the same thickness as the adjacent insulation.

Exposed-to-view insulation shall be finished with a minimum 6-mil dry-film thickness of nonvapor-barrier coating suitable for painting.

In lieu of materials and methods specified above, fittings may be wrapped with a twine-secured, mineral-wool blanket to the required thickness and covered with premolded polyvinylchloride jackets. All jacket ends shall be held in place with ANSI 300 series corrosion-resistant steel straps, 15 mils thick by 1/2 inch wide. Fitting insulation shall be thermally equivalent to pipe-barrel insulation to preclude surface temperatures detrimental to polyvinylchloride.

### 3.1.3 Type T-3, Cellular Elastomer

Piping-system surfaces shall be covered with flexible cellular-elastomer sheet or preformed insulation. The vapor seal shall be maintained. Insulation shall be cemented into continuous material with a solvent cutback chloroprene adhesive recommended by the manufacturer for the specific purpose. The adhesive shall be applied to both of the surfaces on a 100-percent coverage basis to a minimum thickness of 10 mils wet or approximately 150 square feet per gallon of undiluted adhesive.

The insulation on cold water piping shall be sealed to the pipe for a minimum of 6 inches at maximum intervals of 12 feet to form an effective vapor barrier. At piping supports, insulation shall be continuous through using outside-carrying type clevis hangers with insulation shield. Cork or wood dowel load-bearing inserts shall be installed between the pipe and insulation shields to prevent insulation compression.

Hot-water, cold-water, and condensate drain pipes shall be insulated to the extent shown with nominal 3/8- or 1/2-inch thick, fire retardant (FR), cellular elastomer, preformed pipe insulation. Joints shall be sealed with Armstrong 520, or equal, adhesive.

At pipe hangers or supports where the insulation rests on the pipe hanger strap, the insulation shall be cut with a brass cork borer and a No. 3 superior grade cork inserted. Seams shall be sealed with Armstrong 520, or equal, adhesive. The sweat fitting shall be insulated with miter-cut pieces of cellular elastomer insulation of the same nominal pipe size and thickness as the insulation on the adjacent piping or tubing. Miter-cut pieces shall be joined with Armstrong 520, or equal, adhesive. The covers shall be slit and snapped over the fitting, and joints shall be sealed with Armstrong 520, or equal, adhesive.

Screwed fittings shall be insulated with sleeve-type covers formed from miter-cut pieces of cellular elastomer thermal insulation having an inside diameter large enough to overlap adjacent pipe insulation. Pipe insulation shall be butted against fittings. Overlap shall be not less than 1 inch. Armstrong 520, or equal, adhesive shall be used to join cover pieces and cement the cover to the pipe insulation.

Surfaces exposed to view or ultraviolet light shall be finished with a 2-mil minimum dry-film thickness application of a polyvinylchloride lacquer

recommended by the manufacturer, and applied in not less than two coats.

#### 3.1.4 Type T-4, Cellular Glass With Vapor-Barrier Jacket

Piping shall be covered with cellular glass insulation and factory- and field-attached vapor-barrier jacket. The vapor seal shall be maintained. Jackets, jacket laps, flaps, and bands shall be securely cemented in place with vapor-barrier adhesive. Jacket overlap shall be not less than 1-1/2 inches. Jacket bands for butt joints shall be not less than 3 inches wide. Insulation shall be continuous through hangers. Insulation shall be bedded in an outdoor vapor-barrier coating applied to all piping surfaces.

Flanges, unions, valves, anchors, and fittings shall be insulated with factory premolded or prefabricated or field fabricated segments of insulation of the same material and thickness as the adjoining pipe insulation. When segments of insulation are used, elbows shall be provided with not less than three segments. For other fittings and valves, segments shall be cut to the required curvature or nesting size.

The segments of the insulation shall be secured in place with twine or copper wire. After the insulation segments are firmly in place, a vapor-barrier coating shall be applied over the insulation in two coats with glass tape imbedded between coats. The first coat shall be tinted, the second shall be white to ensure application two coats. The coating shall be applied to a total dry-film thickness of 1/16 inch minimum. Glass tape seams shall overlap not less than 1 inch and the tape end not less than 4 inches.

In lieu of materials and methods specified above, fittings may be wrapped with 3/8-inch-thick, vapor-barrier, adhesive-coated strips of cellular elastomer insulation. The insulation shall be under tension, compressed to 25 percent of original thickness, and wrapped until overall thickness is equal to adjacent insulation. The cellular elastomer shall be secured in place with twine and sealed with vapor-barrier coating applied to produce not less than 1/16 inch dry-film thickness. Fittings shall then be covered with premolded polyvinylchloride jackets. Seams shall be made vapor-tight with a double bead of manufacturer's standard vapor-barrier adhesive applied in accordance with the manufacturer's instructions. Jacket ends shall be held in place with AISI 300 series corrosion-resistant steel straps, 15 mils thick by 1/2-inch wide.

Anchors secured directly to piping shall be insulated, to prevent

condensation, for not less than 6 inches from the surface of the pipe insulation.

The white-bleached kraft paper side of jacketing shall be on the side exposed to view. Exposed-to-view insulation shall be finished with not less than a 6-mil dry-film thickness of nonvapor-barrier coating suitable for painting.

### 3.1.5 Type T-5, Calcium Silicate with Glass Cloth Jacket (Piping)

Piping shall be covered with a calcium-silicate pipe insulation with factory attached and presized, white, glass cloth. Jackets shall be field applied when required. Jackets, jacket laps, flaps, and bands shall be securely cemented in place with vapor-barrier adhesive. Jacket overlap shall be not less than 1-1/2 inches. Jacketing bands for butt joints shall be 4-inches wide. Fittings shall be fabricated from segmented pipe barrel sections bedded in general purpose insulating cement and wired in place. Voids shall be filled with general purpose insulating cement with not less than 1/4-inch-thick final coating. Glass lagging tape shall be impregnated with lagging adhesive, wrapped with a 50-percent overlap, and be blended smoothly into adjacent jacketing. Additional adhesive shall be applied as needed and rubber-gloved to a smooth contour.

### 3.1.6 Type T-6, Mineral Fiber with Aluminum Jacket

Piping shall be covered with mineral-fiber pipe insulation with factory-attached or field-applied aluminum jacketing.

Fittings and valve bodies shall be covered with preformed mineral-fiber pipe-fitting insulation of the same thickness as the pipe-barrel insulation. The fitting insulation shall be secured temporarily in place with light cord ties. A 60-mil coating of vapor-barrier mastic shall be applied, and while still tacky, wrapped with glass lagging tape.

Additional mastic shall be applied as needed and rubber-gloved to smooth fillets or contours. On-the-job fabricated insulation for special configurations shall be built up from mineral fiber and a mixture of insulating cement and lagging adhesive diluted with 3 parts water. Only where standard aluminum jacketing cannot be used, the surfaces shall be made vapor-tight by using mastic and glass lagging cloth or tape as specified above with an added finish coat of mastic.

The pipe insulation shall be set into outdoor vapor-barrier coating for a minimum of 6 inches at maximum 12-foot spacing; the ends of the insulation shall be sealed to the jacketing with the same material to provide effective vapor barrier stops.

The vapor barrier shall be continuous over all surfaces, including areas inside pipe sleeves, hangers, and other concealment.

The piping insulation shall be applied to both sides of pipe hangers. Junctions shall be insulated with a special mastic mixture, glass cloth mesh tape, and mastic as previously specified.

Jacket laps, flaps, and bands shall be securely cemented in place with aluminum jacket sealant. Jacketing bands for butt joints shall be 6 inches wide.

Joints, wherever possible, shall be lapped against the weather so that the water will run off the lower edge. Laps shall be in accordance with the pipe drainage pitch. Longitudinal laps on horizontal lines shall be located 45 degrees below the horizontal centerline and alternately staggered 1 inch. The jacketing material shall be lapped a minimum of 2 inches, circumferentially sealed with mastic, and strapped to provide a waterproof covering throughout. Straps shall be located 8 inches on center and shall be pulled up tight to hold jacketing securely in place. Screws shall be used in addition to straps when necessary to obtain a waterproof covering. Extra straps shall be placed on each side of supporting devices and at openings. Where flanging access occurs, a chamfer sheet shall be strapped to the pipe at jacketing.

Exposed longitudinal edges of aluminum jacketing shall be stiffened by bending a 1-inch hem on one edge.

Expansion joints shall provide for maximum and minimum dimensional fluctuations.

To prevent corrosion, the aluminum jacketing shall not come in direct contact with other types of metal.

At openings in jacket, an outdoor vapor-barrier coating shall be applied for 2 inches in all directions; the jacketing shall be applied while waterproofing is tacky.

Screws shall be used at each corner of each sheet, at fitting jackets, and as necessary for the service. No. 7, 3/8-inch long, binding-head aluminum sheet metal screws shall be placed through the mastic seal.

### 3.1.7 Type T-7, Calcium Silicate with Glass Cloth Jacket (Surfaces)

Surfaces shall be covered with insulation block bedded in an insulating cement and covered with glass cloth jacketing.

Surfaces shall be cleaned with a chlorinated solvent. General purpose insulating cement shall be mixed with 3 parts water to 1 part nonvapor-barrier adhesive to bring to application consistency. The block shall be set into bedding and joints and spaces shall be filled with a bedding mix and wrapped with galvanized chicken wire mesh well laced into an envelope. A 3/8-inch-thick coating of bedding mix jacket shall be troweled on with nonvapor-barrier adhesive and glass cloth. Surfaces shall be finished with not less than a 6-mil dry-film thickness of nonvapor-barrier coating.

At the Contractor's option, aluminum sheet jacketing may be used in lieu of glass cloth.

### 3.1.8 Type T-9, Cellular Elastomer

Pump surfaces shall be solvent cleaned. Not less than 1 inch of general purpose insulating cement shall be applied, mixed with nonvapor-barrier adhesive diluted with 3 parts water, to achieve smooth surface and configuration contours. After all water has been removed, surfaces shall be covered with 1/2-inch-thick cellular elastomer insulation attached and joined into a continuous sheet with an outdoor vapor-barrier coating recommended by the insulation manufacturer for the specific purpose. The coating shall be applied to both of the surfaces on a 100-percent coverage basis with a minimum thickness of 10 mils wet, or approximately 150 square feet per gallon of undiluted coating. The coating shall be blended into the adjacent flange insulation and the joint covered with a band of cellular elastomer equal to the flange assembly width. The same coating shall be used to seal insulation to the casing at penetrations and terminations. Pumps shall be insulated in a manner that will permit insulation to be removed to repair or replace pumps.

Insulation shall be finished with a 2-mil minimum dry-film application of a polyvinylchloride lacquer coating recommended by the manufacturer



and applied in not less than two coats.

### 3.1.9 Type T-10, Mineral-Fiber Fill

Voids surrounding pipe shall be packed with mineral-fiber fill.

### 3.1.10 Type T-17, Calcium Silicate Weatherproof Jacket

Piping system surfaces shall be covered with calcium silicate insulation. Fittings and valve bodies shall be covered with preformed insulation of the same material and thickness as the adjoining pipe insulation.

-- End of Section --